

THE BEES OF AUSTRALIA.

By T. D. A. COCKERELL.

(Continued from vol. vi., part iii., p. 236.)

ANTHOPHORIDAE.

These swift-flying long-tongued bees are widely spread over the earth, but are wholly absent from New Zealand and many oceanic islands. In Australia the species are comparatively few, and pertain to only two genera. It was formerly supposed that the genus *Tetralonia* Spinola existed in Australia (*T. brevicornis* Smith and *T. convicta* Ckll.), but it turns out that these are actually forms of *Paracolletes* with unusually long antennae. The mouth-parts are quite unlike those of the *Anthophoridae*.

The two genera of Australian *Anthophoridae* are separable thus:—

Labial palpi two-jointed, with a brush of stiff hairs at the end; maxillary palpi six-jointed; abdomen never with blue or green bands *Asaropoda* Cockerell.
 Labial palpi four-jointed; maxillary palpi six-jointed; abdomen in many species with metallic or brightly coloured bands . . . *Anthophora* Latreille.

Although *Anthophora* is abundant in both hemispheres, while *Asaropoda* is confined to Australia and New Guinea, the latter is not a primitive genus, but has undoubtedly been derived from *Anthophora* or a close relative. *Asaropoda* was confused with the European *Saropoda* Latreille, which, however, has four-jointed maxillary palpi. It must be stated that the mouth-parts have been examined only in the type-species of *Asaropoda*, *A. bombiformis*. The other two are referred here, because they appear to be closely allied.

ASAROPODA Cockerell.

Asaropoda bombiformis (Smith).

A rather large robust red-haired bee, with a conspicuous broad black band at base of second tergite. The legs are largely red, and the scape is red or yellow in front; the clypeus is without dark markings (except a slender black line along each lateral suture above) in both sexes. Victoria to Queensland. Also Binaturi River in New Guinea. A new locality is Montville, Queensland. (C. Borch).

Asaropoda alpha (Cockerell).

Male; differs from *A. bombiformis* by its smaller size (length less than 12 mm.); hair on hind tarsi entirely black, except a small orange tuft at base above; lateral margins of clypeus with a rather broad black band; flagellum ferruginous beneath, except base of first joint; legs dark, but covered above with orange hair; beneath with black, except that the tarsi are as just described; the bidentate apex of abdomen covered with black hair (fulvous in *A. bombiformis*). Described from a specimen in British Museum, labelled Australia, and recorded by F. Smith as a variety of *A. bombiformis*.

Asaropoda anomala Cockerell.

Male; appearing exactly like *A. bombiformis*, with broad bare black band at base of second tergite, but easily distinguished by the third antennal joint, which is short and thick (instead of being long and slender), and by the longer flagellum, its length fully 5.5 mm. (instead of about 4). Femora clear red, the posterior ones a little dusky beneath at base. The apex of abdomen is obtusely bilobed (without the distinct angles of *A.*

bombiformis.) The female is like *A. bombiformis*, but rather larger and more robust. Hair-bands of second and third tergites broad, the anterior half greenish; hair of fourth and fifth tergites greenish, with a beautiful golden lustre. Brisbane. In American Museum of Natural History. (Amer. Mus. Novitates, 346, pp. 15-16.).

Friese (Deutsch. Ent. Zeitschr., 1911, p. 448) described *Anthophora flava* from a female taken at Freemantle, W. Australia. He said it was very like *A. bombiformis* (with tegument of abdomen black under the hair), but thickly covered with yellow hair; even the abdomen on tergites 2 and 3. Clypeus and labrum yellow, mandibles yellow, legs yellowish, tegulae yellow. He also described *Anthophora rufescens* as related to (or similar to) *A. bombiformis*, but this is evidently very close to *Anthophora rhodoscymna* Ckll.

ANTHOPHORA Latreille.

There are two groups of species, the first of which is more characteristically Australian, while the second is spread over the tropics of the Old World, and presumably reached Australia in comparatively recent times.

Abdomen not, or not obviously banded; covered with appressed hair. Group 1.
Abdomen conspicuously banded, the bands usually brightly coloured. Group 2.

GROUP 1.

Covered with short green or greenish pubescence, sometimes strongly reddish on abdomen in males; legs always with some bright emerald green hair; clypeus of male orange, with a small black bar on each side above, of female with a large black mark on each side, the pale area coming to a point above

. *aeruginosa* Smith.

Covered with mouse-grey hair *preissi* Cockerell.

Appressed hair of abdomen fulvous 1.

1. Tegument of abdomen black, except broad hind margins of segments; clypeus of female yellow, with two large brown patches; tegulae clear testaceous *scymna* Gribodo.

Tegument of abdomen red; clypeus in both sexes with a reversed T in yellow; female 16.5 mm. long, with no supraclypeal or lateral face-marks; tegument of abdomen above entirely bright ferruginous. *rhodoscymna* Cockerell.

Resembling *A. rhodoscymna*, but with a large black spot on disc of second tergite; length, 13-14 mm.; tegulae yellowish
. *rufescens* Friese.

Anthophora aeruginosa Smith.

A very distinct and easily recognised species, found from Hunter River, N.S.W., to Northern Queensland and Port Darwin.

Anthophora preissi Cockerell.

Discovered by Preiss in Western Australia; type in Berlin Museum. There is in addition a race *A. preissi froggatti* Cockerell, found by Froggatt at Brewarrina, N.S.W. The female of this form is about 16 mm. long, with the same mouse-coloured hair, but has the antennae black, flagellum not red beneath; a transverse yellow supraclypeal band, and lower corners of

clypeus broadly pale yellow; median pale stripe on clypeus narrow, not tapering above. Female of typical *A. preissi* is about 15 mm. long.

Anthophora rhodoscymna Cockerell.

Male about 12.5-13 mm. long, female about 16.5. Discovered by Gilbert Turner in the Mackay district of Queensland, but extending south to Brisbane. The type is in the British Museum.

Anthophora rufescens Friese.

Described in 1911, from a specimen taken by Turner at Mackay. It may prove to be a variety of *A. rhodoscymna*.

Anthophora scymna Gribodo.

Reported from Adelaide, West Australia and Queensland. A specimen in the British Museum was obtained by Du Boulay at Champion Bay, W. Australia, in 1866-67.

GROUP 2.

- Abdominal bands pale lilac, the first two in the male suffused with ochreous; fifth ventral segment of male with a deep broad rounded emargination *lilacina* Cockerell.
- Abdominal bands not lilac 1.
1. Clypeus light, with a black stripe on each side of upper part; males 2.
- Clypeus with at least large black marks 4.
2. Larger, about 13 mm. long; hair of thorax above bright orange-fulvous, with black intermixed; abdominal bands bright blue.
- *cingulata* Fabricius (var. *gilberti* Ckll.)
- Smaller; abdominal bands greenish or ochreous or pallid. 3.
3. Hair of thorax above bright orange-fulvous, with black intermixed; abdominal bands emerald green shading to blue
- *cingulata* Fabricius (*emendata* Smith.)
- Hair of thorax above ochreous or light fulvous, with black intermixed; abdominal bands very light bluish or greenish
- *zonata* Linnaeus (*pulchra* Smith.)
- Looking like *A. zonata* (*pulchra*), but with conspicuous black hairs on vertex and front, broader face, deeply emarginate fifth ventral segment, and entirely black-haired hind tarsi . . *asserta* Cockerell.*
4. Males 5.
- Females; size larger; clypeus with a light reversed T., its stem tapering above, pointed 7.
5. Sides of clypeus broadly black, leaving a light pyramid, which is notched on each side; abdominal bands dull white; length about 11 mm.
- *salteri* Cockerell.
- Clypeus yellow, with a large foot-shaped mark, with a very long heel,

* Since writing the above, I have examined two pairs of *Anthophora* sent by F. Erasmus Wilson, and find that there are complications yet to be dealt with. They come from Redcliffs, Victoria (*L. H. Chandler*) and Blackall, Queensland (*C. Borch*). In both males the clypeus is broad above, the straight upper margin of the yellow much longer than the distance from its ends to the orbits. In a male *A. zonata* from Thursday Island, the upper edge of the yellow is much shorter than the distance from its ends to the orbits. I am calling all Mr. Wilson's specimens *A. zonata*, but I now feel that the value and significance of the names *zonata*, *pulchra* *asserta* need reconsideration, and would urge Australian students to dissect specimens from as many localities as possible.

- on each side above; abdomen with bright shining blue bands, with no tinge of green *darwini* Cockerell.
- Clypeus with a large reversed T. in yellow, its stem broadly truncate on upper margin 6.
6. Length about 10 mm.; hair of mesothorax light blue mixed with black; abdominal bands largely green *walkeri* Cockerell.
- Length about 11 mm.; hair of mesothorax yellow mixed with black; abdominal bands light yellowish, with a sort of greenish tint *adelaidae* Cockerell.
7. Hair of mesothorax light greenish mixed with black; light hair on outer side of middle legs strongly suffused with blue; abdominal bands light blue *chlorocyanea* Cockerell.
- Hair of mesothorax light blue mixed with black; abdominal bands very bright greenish-blue *walkeri* Cockerell.
- Hair of mesothorax very bright orange-fulvous mixed with black; light hair on outer side of hind legs orange-fulvous; larger than the next species *cingulata* Fabricius (var. *gilberti* Ckll.)
- Hair of mesothorax paler fulvous, inclining to greenish and mixed with black; light hair on outer side of hind legs white *zonata* Linnaeus (*pulchra* Smith.)
- Length nearly 13 mm.; hair of thorax above pale fulvous mixed with black; abdomen with four light blue bands, fifth tergite with a tuft of white hair in middle and much white hair at sides; hind basitarsus with a tuft of white hair at base; flagellum dark. Abdominal bands narrower and bluer than in *A. chlorocyanea*. *asserta* Cockerell.

Anthophora adelaidae Cockerell.

Described from a male in the British Museum, collected by J. J. Walker on the Adelaide River, N. Australia. There are several specimens in the Hope Museum at Oxford.

Anthophora asserta Cockerell.

Described in Ann. Mag. Nat. Hist., August, 1926, from specimens in the National Museum of Victoria. Males from Lower Fern Tree Gully, Victoria; female from Canterbury.

Anthophora chlorocyanea Cockerell.

This is the species which was formerly mistaken for *A. cingulata*. South Australia.

Anthophora cinctofemorata Sichel.

Published by Dours in his Monograph of *Anthophora* (1869). It is based on a male from "New Holland," 9 mm. long, without head (which was missing in type); anterior wing 7 mm.; thorax and legs with silvery hair; abdomen black, very strongly punctured; tergites 3 to 6 with blue (somewhat greenish) bands; wings dusky. I have never seen a specimen. Owing to the loss of the head, it cannot be placed in the table.

Anthophora cingulata Fabricius.

This is *A. emendata* Smith, but Meade-Waldo found that it was the real *cingulata*. The larger, very richly coloured form from the Mackay district, which I named *gilberti*, may perhaps be a valid race. The typical (*emendata*) form is also from Queensland. For a further discussion, see

Ann. Mag. Nat. Hist., October, 1905, p. 396; but Meade-Waldo states that the type of *A. emendata* is a male, not a female, as stated by Smith.

Anthophora darwini Cockerell.

Discovered by Turner at Port Darwin; type in British Museum.

Anthophora lilacina Cockerell.

Discovered by Dodd at Kuranda, Queensland. Type in Queensland Museum.

Anthophora salteri Cockerell.

Parramatta and Sydney, N.S.W., the type found by W. R. Salter, and now in British Museum.

Anthophora walkeri Cockerell.

Found by J. J. Walker on the "Penguin" Expedition, on Baudin Island, Long Reef, W. Australia. Type in British Museum.

Anthophora zonata (Linnaeus).

Widely distributed in Queensland, and extending to Adelaide, S.A., and W. Australia. A colour variation has been referred to as *A. zonata subcaerulea*, but it appears not to be the genuine (Asiatic) *A. subcaerulea* of Lepeletier, for the characters of which see Ann. Mag. Nat. Hist., May, 1911, p. 492. It is possible that more intensive studies may indicate the separation of the Australian insect from *A. zonata*, in which case it will take the name *A. pulchra* Smith. Smith described *A. pulchra* from Cape Upstart, Moreton Bay and Hunter River.

NOMADIDAE.

Parasitic bees related to the *Anthophoridae*, and, indeed, placed in that family by Perkins (1919), where *Nomada* is recognised by the absence of a pollen-collecting scopa, and the marginal cell pointed at the apex. However, *Nomada* differs from the *Anthophoridae* (except *Melitoma*) by the absence of the outer comb of the maxillae; the inner comb is also lacking, as in *Melitoma* and many diverse genera. I have considered *Nomada* to be derived from an ancestor allied to the *Panurgidae*, but it is now an isolated genus. There are three cubital cells in the anterior wings; marginal cell pointed on costa; maxillary palpi six-jointed; general appearance usually wasp-like, with ferruginous or yellow markings. The species are generally parasitic in the nests of *Andrena*, which does not occur in Australia, but many are undoubtedly associated with *Halictus*.

There are some species of *Nomada* which have only two cubital cells. This is the case with *N. (Heminomada) oblitterata* Cresson, of North America, but it is not constant, some specimens being found with three cubital cells. Robertson found about 25 per cent. of his specimens, collected in Illinois, had the three cells. Thus we see within the species the stages in the production of a condition which is characteristic of the *Panurgidae*. The Indian *Lamproapis* Cameron, supposed to be allied to *Dufourea*, is a *Nomada*, with two cubital cells, as I have been able to ascertain from a specimen received from the British Museum, collected at Simla. The species will stand as *Nomada maculipennis* Cameron.

NOMADA Fabricius.

Nomada australensis Perkins.

This was taken at Cairns by Turner and Dodd, and at Mackay by

Turner. There are six specimens in the British Museum, where there is also a specimen of an undescribed species from New Guinea. The female *N. australensis* is 6 mm. long; the size of the male is not stated, but is presumably about the same. The male has the head and thorax black or nearly so; mandibles, cheeks, labrum, clypeus, a narrow line along inner orbits reaching the vertex, antennae beneath, scutellum and postscutellum pale yellowish brown; abdomen dark or blackish brown, more or less paler at the articulations of the segments; second tergite with a round pale yellow spot on each side, third to fifth with smaller spots. The female has the whole face reddish, except the middle of front; mesonotum entirely reddish, except a dark median line; legs brownish yellow. A variety from Mackay has the clypeus largely black in the middle and the orbital lines very widely broken.

Among all the Australian bees submitted to me at different times, I have never found this species. Mr. T. Rayment (1930) has recently described a species *Neoceratina rubinii* from Queensland, and this is evidently a *Nomada*. It was taken by Charles Barrett at Townsville. There is a good figure in Proc. Roy. Soc. Victoria, xliii., p. 56. It seems probable that it is identical with the species described by Perkins.

MELECTIDAE.

This family is represented in Australia by one genus:—

CROCISA Jurine.

Consisting of stout-bodied bees of medium to rather large size, having the scutellum extended posteriorly, in the form of a flattened place, which is deeply incised or emarginate, the margin often having the form of the letter W. These insects are among the most beautiful of bees, the pubescence taking the form of blue or white spots or bands, when blue often shining as if metallic. They are parasitic in nests of *Anthophora*, and are widespread in the warmer parts of the Old World. One species, as I am informed by Dr. J. Bequaert, has been taken as far north as Belgium. Although there are many *Anthophora* in America, *Crocisa* is wholly wanting.

There are two blue-spotted species of *Crocisa*, *C. novae-hollandiae* Lepelletier and *C. nitidula* Fabricius, which have been reported from Australia, but appear not to exist there. I know them from Amboina. Dr. P. Meyer has revised the genus *Crocisa* in Archiv. f. Naturgeschichte, 1921.

(A.) White-spotted species.

- Length, 11-12 mm.; second tergite with an interrupted white band; margin of scutellum W-like *rotundata* Friese.
 Second tergite with four white spots 1.
 1. Middle and hind tibiae white only at base; size large . . *lugubris* Smith.
 Anterior and middle tibiae covered with white hair on outer and posterior side, except at apex; hind tibiae with the apical half free from white hair, except posteriorly; a much smaller species than *C. lugubris*, the male only 9 mm. long. *waroonensis* Cockerell.
 Middle and hind tibiae covered with white hair on outer side 2.
 2. Larger; margin of scutellum W-like *macleayi* Cockerell.
 Smaller; margin of scutellum bracket-like, the edge on each side of the middle curved *quadrinaculata* Rads.

Crocisa lugubris Smith.

Described from "Australia," the type in British Museum. *C. albopicta* Cockerell, from Mackay, Queensland, was described as a distinct species, but on comparing my type, in the British Museum, with Smith's type of *C. lugubris*, I concluded that it could only rank as a variety or race of the latter. The spots are of the same colour in both. *C. albopicta* has a spot of white hair at median base of first abdominal tergite, and the anterior median mark on mesothorax is bar-like. In *C. lugubris* there is no white spot at median base of first tergite, and the anterior median mark on mesothorax is pyriform in outline.

Crocisa macleayi Cockerell.

Female a little over 14 mm. long. New South Wales. Type in American Museum of Natural History, New York.

Crocisa quadrimaculata Radoszkowski.

Finke River, South Australia; also Adelaide.

Crocisa rotundata Friese.

This is *C. albomaculata* Smith (the name preoccupied) and *C. albovittata* Friese. It is reported from Champlon Bay and King George's Sound, W.A., and Mackay, Queensland.

Crocisa waroonensis Cockerell.

Discovered by G. F. Berthoud at Waroona, W.A. It is also known from Perth, and from Hermannsburg, Central Australia.

(B.) Blue-spotted species.

- At least some of the tergites four-spotted 1.
 None of the tergites four-spotted, the lateral marks being undivided 2.
1. Margin of scutellum bracket-like *lamprosoma* Boisduval.
 Margin of scutellum W-like *turneri* Friese.
 2. First tergite with the blue extending right across
novae-hollandiae Lep. and *nitidula* Fab., not considered Australian.
 Abdominal bands all interrupted in the middle 3.
 3. Blue markings shiny; margin of scutellum bracket-like. 4.
 Blue markings not shiny; margin of scutellum W-like 5.
 4. Hair on middle of occiput black with white on each side; apex of male abdomen more narrowly truncate *omissa* Cockerell.
 Occiput with a complete conspicuous fringe of white hair; apex of male abdomen more broadly truncate; size smaller, not over 9 mm. *darwini* Cockerell.
 5. Large, length about 15 mm.; markings of abdomen pale blue.
 *tincta* Cockerell.
 Smaller, about 11 m.; markings of abdomen bright turquoise-blue, but not shining *beatissima* Cockerell.

Crocisa beatissima Cockerell.

Described from a female, in the British Museum, collected at Adelaide.

Crocisa darwini Cockerell.

Port Darwin, the type in British Museum.

Crocisa lamprosoma Bolsduval.

This beautiful species appears to be rather common in Queensland, and goes south to the Blue Mountains, N.S.W. *C. australensis* Radoszkowski, said to go south to Tasmania, appears to be identical, and *C. caeruleopunctata* Blanchard is probably another synonym.

Crocisa omissa Cockerell.

Common in Queensland, and also found in New South Wales. It has been erroneously recorded as *C. quartinae* Gribodo and *C. caeruleifrons* W. F. Kirby, species which do not occur in Australia.* *C. omissa* occurs on Dunk Island.

Crocisa tincta Cockerell.

Toowoomba, Queensland; type in British Museum.

Crocisa turneri Friese.

Mackay and Cairns, Queensland; Meyer also cites it from Sydney, N.S.W.

ANDRENIDAE, subfamily NOMIINAE.

NOMIA Latreille.

The characters of this genus have recently been discussed at length in American Museum Novitates, 433 (October, 1930.) No less than fourteen segregates or subgenera have been proposed for the *Nomia* of different parts of the world, and it is a fact that the genus as now understood contains very diverse elements. For example, in some species the tongue is short or dagger-shaped, but it is long and slender in others, remarkably so in the Australian *N. gilberti* Ckll. Among the Halictine bees there is also a group with linear tongues, paralleling the condition of the long-tongued *Nomia*, but, of course, arising quite independently. In some species of *Nomia* the tegulae are very large, in others they are quite ordinary. There is a group with spined postscutellum. Using these and other characters, it would be possible to split *Nomia* up into a number of genera, and, as long ago as 1899, Ashmead recognised four genera. In a paper shortly to be published, I have treated the African *Meganomia* as a separate genus. No one, however, has yet treated the *Nomia* of the world in a single monograph, with adequate structural studies. *Nomia* may be confused with *Halictus*, and has been by describers of bees; but it is really very different. In the anterior wings, the small second cubital cell, with a large or long cell on each side of it, and the obtuse end of the marginal cell, are very distinctive. The males often have highly modified hind legs. The structure of the base of the metathorax differs from that of *Halictus*. The straight basal nervure (as in *Andrena*), contrasted with the arched or curved nervure of *Halictus*, is not reliable. Various Australian species of *Nomia*, especially for instance *N. brisbanensis* Ckll., have the basal nervure very strongly arched. Indeed, the arched nervure is normal for Australia *Nomia*.

The remarkable group *Reepenina* Friese, with a stigma on the hind wings, was proposed by Friese as a subgenus, based on a species (*N. variabilis* Friese) found in New Guinea. An Australian species has been discovered at Cape York, and I am treating *Reepenina* as a genus. It was, however, an error to refer *Tetralonia brevicornis* Smith to it. The follow-

* See Records Australian Museum, 1929, p. 231, where they are recorded from New Guinea.

ing key to Australian *Nomia* includes the species available when it was made, but all the species appear in the list beyond.

(A.) Metallic species, with blue or green colours.

- (a.) *N. Australica* group; large forms, the male sometimes hardly metallic.
 Clypeus of female broadly red apically *australica* Smith.
 Clypeus of female wholly dark *australica reginae* Ckll.
 Male with scape and flagellum both dark; hair of face, occiput and cheeks white; wings hardly at all dusky; abdomen dark purple-blue, not greenish; hair-bands white, only slightly tinged with yellowish *australica regis* Ckll.

The female *N. subaustralica* Ckll., about 11 mm. long, is black, the abdomen somewhat metallic; scape red in front; first recurrent nervure meeting second intercubitus; postscutellum covered with fulvous hair.

(b.) *N. flavoviridis* group, smaller species.

- Larger and more robust; mesothorax and scutellum entirely black; abdomen dark blue, not at all green, but may be red at end; female *gracilipes* Smith.
 Smaller and less robust; mesothorax metallic; abdomen green or bluish 1.
 1. Females 2.
 Males 3.
 2. Dark olive green, with fulvous tegulae; hind tibiae and basitarsi (except apically) clear ferruginous; punctures of disc of mesothorax distinct and separate under a lens (very different from *N. flavoviridis phanecura*); scutellum with a pair of black shining impunctate elevations (not present in *phanecura*) . . *hippophila* Ckll.
 Tegulae rufofulvous; hind tibiae and tarsi dark, with white hair; punctures of disc of mesothorax finer or denser; scutellum with no shining elevations *flavoviridis* Ckll.
 Head, thorax and abdomen entirely dark blue; apex of abdomen fringed with pale chocolate hair; anterior half of clypeus black; legs very dark rufous; mesothorax with minute punctures, and scattered larger ones, in the manner of *N. australica* *flavoviridis doddi* Ckll.
 Antennae dark, flagellum ferruginous beneath; nervures and stigma clear ferruginous; abdomen very green *flavoviridis adelaidella* Ckll.
 Smaller than typical *flavoviridis*, the length about 7 mm.; head and thorax dark bluish green, area of metathorax yellowish green; mesothorax dull and granular, the scattered punctures hard to observe (they are quite distinct in *flavoviridis* proper); tegulae large, bright apricot colour (in true *flavoviridis* dark brown, with hyaline borders); stigma and nervures red-brown; fifth tergite and apex of abdomen ferruginous . . *flavoviridis phanerura* Ckll.
 Head, thorax and first tergite blue; rest of abdomen almost black; legs brownish black; tegulae very dark rufous *babindensis* Ckll.
 3. Flagellum bright ferruginous, above and beneath; nervures and stigma clear ferruginous; abdomen greener than head and thorax. *flavoviridis adelaidella* Ckll.
 Flagellum black above (or dark brown in *N. hippophila*). 4.
 4. Tibiae entirely ferruginous, not at all metallic; tegulae clear apricot colour; a dark green insect (not at all blue) *flavoviridis phanerura* Ckll.

- Tibiae red with metallic reflections; tegulae rufofulvous; dark blue bee, with third and following tergites olive green *flavoviridis doddi* Ckll.
- Legs typically coloured as in *doddi*, varying to dark tibiae; mesothorax yellowish green *flavoviridis* Ckll.
- Legs dark; tegulae dull rufous (not apricot colour); head and thorax dark green; abdomen blue-green; much smaller than *doddi* *flavoviridis cyanella* Ckll.
- Rather larger, green, with bright red tegulae; legs mainly red, the tibiae entirely red *flavoviridis excellens* Ckll.
- About 7.5 mm. long; dark greenish, less robust and less metallic than *flavoviridis*; tegulae rather large, shining rufous; legs red-brown, the femora and tibiae more or less greenish metallic; stigma paler *hippophila* Ckll.
- Head and thorax olive green, with coppery tints; tegulae fulvous (or with a basal black shade), with pallid margins; hind femora metallic green, red at apex; hind tibiae mainly green *hippophila purnongensis* Ckll.
- Head, mesothorax and scutellum black, pleura dark green; lower half of clypeus white; tegulae clear bright apricot colour; stigma and nervures fuscous; abdomen olive green; third and fourth sternites each with a pair of light ferruginous protuberances *testaceipes* Friese.

(B.) Non-metallic species.

- Postscutellum with a forked process 1.
- Postscutellum without such a process 2.
1. Abdominal bands light green *darwinorum* Ckll.
- Abdominal bands suffused with vermillion *lyonsiae* Ckll.
2. Abdomen with bright orange tegumentary bands; large species *aurantifer swainsoniae* Ckll.
- Abdomen without such bands 3.
3. Apical part of abdomen (not merely borders of tergites) broadly red *ferricauda* Ckll.
- (Robust shining female from Como, N.S.W. . . *ferricauda musgravei* Ckll.)
- Apical part of abdomen not thus red 4.
4. Anterior wings with a conspicuous dark apical spot 5.
- (Apex dusky; abdomen long, claviform . . *pseudoceratina* Ckll.)
- Anterior wings not thus spotted 6.
5. Flagellum about 3.3 mm. long; more robust; hair on face pure white *kurandina* Ckll. (*macularis* Fr.)
- Flagellum a little over 2 mm.; less robust; hair on face dull and slightly yellowish *melvilliana* Ckll.
- (Large form from N.S.W. . . *kurandina fortior* Ckll.)
6. Legs pale testaceous; mesothorax and scutellum dark red; scutellum with two pointed eminences *Reepenia eboracina* Ckll.
- Otherwise 7.
7. Hind tibiae and tarsi clear bright red; tegulae bright red 8.
- Hind tibiae and tarsi not thus red 11.
8. Hind margins of tergites black *frenchi* Ckll.
- (*N. frenchi* has thin white hair-bands. The following separates it from species with dusky red hind tibiae and tarsi:—
- Flagellum all black *frenchi* Ckll., male.
- Flagellum red beneath.

- Flagellum longer, dark above
- *brisbanensis* Ckll., male (very near *frenchi*.)
- Flagellum shorter, all red *nana* Sm., male.
- Female with broad ochreous hair-bands on abdomen
- *satelles* Ckll. (near to *nana*.)
- Hind margins of tergites fulvous or yellowish red 9.
9. Sides of mesothorax broadly covered with fulvous tomentum
- *tomentifera* Friese, both sexes.
- Sides of mesothorax not so covered 10.
10. Female *semiaurea* Ckll.
- Male *rufocognita* Ckll.
- (Probably sexes of one species; see Entomologist, 1913, p. 121.)
11. Abdomen with broad bands of tomentum, in style of *N.*
- austratica* 12.
- Not like *N. australica* in abdomen 15.
12. (All have clear red tegulae.)
- Middle of mesothorax, except posteriorly, with tegument red.
- *dimissa* Ckll., female.
- Mesothorax without red 13.
13. Female; hair-bands ochreous *satelles* Ckll.
- Males 14.
14. Mesothorax more hairy *satelles* Ckll.
- Mesothorax less hairy *nana* Smith.
- (These two are probably forms of one species.)
15. Abdomen claviform, with narrow base, and narrow ochreous hair-
- bands 16.
- (With white hair-bands; knees red; tarsi very pale reddish. *Williamsi* Ckll.)
- Abdomen otherwise 17.
16. Nearly 10 mm. long, first tergite very long . . . *pseudoceratina* Ckll., male.
- Not so long; stigma much paler *halictella* Ckll., male.
17. Hind tibiae dusky red (red with a black spot in *ulongensis*)
- 18.
- Hind tibiae black, at most red at end (red in *ulongensis*) 19.
18. Flagellum black (also in *ulongensis*) *frenchi* Ckll., male.
- Flagellum red beneath *brisbanensis* Ckll., male.
- (Antennae much shorter than in *frenchi*; legs dark brown. *geophila* Ckll.)
19. Hind basitarsi red (whitish in male *williamsi*) 20.
- Hind basitarsi black or very dark brown 24.
20. Larger; abdomen very black, margins of tergites not testaceous
- *moerens ulongensis* Ckll., male.
- Smaller; abdomen with margins of tergites beyond first testaceous
- 21.
21. Male (Thursday I.) *semiaurea thor* Ckll.
- Females 22.
22. First tergite subtriangular in outline, seen from above.
- *halictella* Ckll., female.
- First tergite short and very broad 23.
23. Smaller; abdomen more distinctly punctured . . . *semipallida* Ckll.
- Larger; abdomen less distinctly punctured; hind tarsi obscure reddish *tenuihirta* Ckll.
24. A light band of hair in suture behind mesothorax (traces of band in larger *semiaurea*) 25.
- No such light band of hair 28.

25. The light band, and tomentum covering postscutellum, fulvous 26.
 The light band, and hair on postscutellum, white 27.
26. Area of metathorax broadened in middle *triangularis* Ckll.
 Area of metathorax narrow in middle *halictella* Ckll.
27. Larger; area of metathorax sharply bounded *moerens* Smith.
 Smaller; area not sharply bounded; postscutellum covered with dense
 pure white tomentum *grisella* Ckll.
28. Hind margins of tergites beyond first broadly pale orange (Thursday
 Island) *semiaurea thor* Ckll.
 Tergites not thus 29.
29. Extreme apex of abdomen clear red 30.
 Apex not thus red 31.
30. Broad hair-bands on abdominal tergites 3 and 4
 *victoriae* Ckll. (*fulvoanalis* Fr.)
 Lacking broad hair-bands on tergites 3 and 4; tergites 1 to 4 with
 only short lateral stripes of pure white hair *analis* Friese.
31. Females 32.
 Males 35.
32. Mesothorax covered with short grey hair, behind which is the intense
 black scutellum, and then dense pure white hair covering post-
 scutellum *muscosa* Ckll., female.
 Not thus ornamented 33.
33. Tegulae black; wings very dark 34.
 Tegulae dark rufous; scutellum dull *brisbanensis* Ckll.
 Tegulae pale testaceous, with or without a dark spot . *tenuihirta* Ckll.
34. *submoerens* Ckll. and *moerens* Sm.
 (*Submoerens* has transverse cross-striated channel of metathorax
 much narrower in middle, its lower margin straight, except at
 sides; wings shorter, nervures darker; tegulae anteriorly with a
 pale marginal spot.)
35. Mesothorax covered with short moss-like grey hair . . *muscosa* Ckll.
 Mesothorax not so covered 36.
36. Tegulae very dark brown. *hypodonta* Ckll. var. a. (Turner, 697.)
 Tegulae broadly pale margined *gilberti* Ckll.
 (Like *gilberti*, but antennae a little shorter, mesothorax shining,
 postscutellum, without the dense covering of pure white hair.
geophila Ckll.)

Nomia aenea Smith.

Based on a male from Port Essington. It is obscurely aeneous; femora rufo-piceous, tibiae and tarsi ferruginous; flagellum fulvous beneath; apical margin of clypeus and mandibles ferruginous; wings hyaline; apical margins of second and following tergites with pale fulvous pubescence. The hind leg is figured in Trans. Ent. Soc. London, 1875, pl. 2, fig. 13. This is a small species, of the *N. flavoviridis* group, not found in recent years.

Nomia aerata Smith.

Described from a male, with no better locality than Australia. It is even smaller than *N. aenea*, of a brassy colour, the head and thorax obscurely so. The flagellum, anterior margin of clypeus and mandibles (except extreme base) rufo-fulvous; legs ferruginous, the femora rufo-piceous above; hind femora slightly swollen, and tibiae dilated at apex; abdomen bright and brassy.

Nomia alboscopacea Friese.

Recorded from Queensland; Mackay, Cairns, Atherton and Colosseum. Female 9 mm. long, male 8 mm. It is said to be nearest to *N. dentiventris* Smith, but more robust, with simple hind legs and venter in male. The female is black, the mesothorax densely yellowish-grey haired; tegulae pale, with browner disc. The abdomen has distinct hair-bands only on tergites 3 and 4. I think this is identical with *N. tenuihirta* Ckll.

Nomia analis Friese.

Found by Turner at Mackay, at flowers of *Cassia*. I had it as a variety of *N. victoriae*, but it appears to be a distinct species, lacking the broad hair-bands on tergites 3 and 4, tergites 1 to 4 having only short lateral stripes of pure-white hair. In nearly all respects it agrees with *N. victoriae*.

Nomia argentifrons Smith.

A small species, size of *N. aenea* (length 4 lines), in the collection of Sir John Lubbock. The sex is not given, but it is evidently a male, having the hind femora incrassate, the tibiae incrassate and broadly expanded at apex. Black, with scape in front, apex of clypeus, mandibles and anterior tibiae in front pale rufotestaceous; flagellum fulvous beneath; wings hyaline, faintly clouded at apical margin; tergites with white hair-bands, the first broadly interrupted.

Nomia aurantifer Cockerell.

Cairns and Kuranda, Queensland; type in British Museum. *N. luteofasciata* Friese, is the same. *N. aurantifer swainsoniae* Cockerell, is a race described from the National Park, Queensland, but also found by Gibbons at Sydney.

N. aurantifer is a magnificent species, the female about 12 mm. long, with the hind margins of tergites 2 to 4 broadly smooth and shining, and of the most brilliant orange; the wings are strongly infuscated. The race *swainsoniae* (found at flowers of *Swainsonia*) has also an orange band, broadly interrupted in middle, on first tergite; wings dusky subhyaline, with the apical margin broadly darkened. The male *swainsoniae* has five orange bands, the first very slender, and obsolescent in middle; the hind tibiae are swollen, with a large apical finger-like projection, but no spurs.

Nomia australica Smith.

This is the common, relatively large, metallic species, found from West Australia to Victoria, and north to Queensland. Two races have been described; *reginae* Ckll., from Mackay and Townsville, Queensland, and *regis* Ckll., from north-west Australia. The race *reginae*, omitted from Hacker's Catalogue, is described in both sexes in Entomologist, September, 1905, p. 221. Adelaide is to be considered the type locality of *N. australica*. Specimens from Melbourne show a black clypeus and scape in the female, and scape varying from black to red in the male. The race *reginae* has the hair-band on second tergite entire. At Sandringham, Victoria, Mr. Rayment finds *N. australica* visiting *Coreopsis* and *Hypochaeris*.

Nomia babindensis Cockerell.

Female about 6 mm. long, taken by F. X. Williams at Babinda, Queensland, in 1919. It is known among the metallic species by the small size

and blue colour, with dark tegulae and mainly black abdomen. The antennae are dark.

Nomia brisbanensis Cockerell.

Brisbane, Stradbroke Island and Bribie Island, Queensland. Related to *N. moerens* Smith, but less robust and with much lighter tegulae. I thought at first it might be a colour-variety of *N. frenchi* Ckll., but the fourth sternite in middle is smooth and shining, with a strong sulcus, which ends a little before the emarginate apex; whereas the fourth ventral in *frenchi* is roughened and slightly ridged in middle, with a rudimentary sulcus at extreme base.

Nomia darwinorum Cockerell.

Male collected by Turner at Port Darwin; type in British Museum. Length about 10.5 mm.; very close to *N. pulchribalteata* Cameron from New Britain, but somewhat larger; hair of face very dense, greyish white; wings clearer; hind femora more swollen; hind tibiae and tarsi without red; abdominal bands considerably broader, apple-green, shot with vermillion; fourth sternite with a very distinct fringe of white hair. The scutellum is bituberculate, and the postscutellum has a pair of long tooth-like structures.

Williams collected both sexes at Halifax and Babinda, Queensland. The female proves to agree very nearly with *N. rubroviridis* Ckll., except that the flagellum is variably reddened beneath, and the hair of the apical tergites is very dark fuscous, not ochreous. It thus appears probable that *N. darwinorum* is no more than a race of *N. rubroviridis*.

Nomia dentiventris Smith.

Based on a small male from Sydney, of the same size as *N. aenea*. Black, the abdomen with pale fulvous hair-bands, the third sternite with two blunt teeth; hind femora dilated, the tibiae dilated and abruptly narrowed at their base; tegulae dark rufo-testaceous; legs rufo-piceous, with tibiae, tarsi and apex of femora ferruginous.

Nomia dimissa Cockerell.

Found by F. P. Dodd in the Cairns district, Queensland. The male is like *N. australica reginae*, but is smaller and more slender (length about 10.5 mm.), with hyaline wings, faintly dusky at apex; hair of face white, hardly perceptibly yellowish; abdomen dark blue; hind tibiae, seen from behind, with the inner margin strongly angulate below the middle; anterior lobe of hind tibiae much more broadly truncate. Known from *N. australica regis* by the flagellum ferruginous beneath, and the abdominal hair-bands strongly yellow. The female has a large red patch on mesothorax in front.

Nomia ferricauda Cockerell.

Discovered by Hacker at Brisbane in 1911. It is black, about 3 mm. long (female), and readily known by the black and red abdomen. The legs are dark. Mesothorax dull, with scattered large punctures and numerous extremely minute ones. At Como, N.S.W., Musgrave and Campbell found a distinct race, *N. ferricauda musgravei* Ckll., the female with the third tergite all black, with the broad band of appressed hair greyish-white; fourth tergite black at base, and more broadly at sides, the abdomen beyond this red; area of metathorax not so large, and not so distinctly and regularly cross-ribbed.

Nomia flavoviridis Cockerell.

The type, from Mackay, is in the British Museum. There are several races or subspecies, the characters of which are given in the table. *N. f. doddi* Ckll. was based on males from Townsville (F. P. Dodd), and a female from Parry Harbour, Cape Bougainville.

N. f. Adelaidella Ckll. is from Adelaide (Schomburgk), the type in the Berlin Museum.

N. f. cyanella Ckll. was taken by Turner at Cooktown, Queensland. *N. f. phanerura* Ckll. was from Mackay (Turner), but has since been taken as far south as Brisbane.

N. f. excellens Ckll., collected by C. Gibbons at Sydney, is in the Australian Museum. (See Records Australian Museum, xvii., 1929, p. 226.) The *N. flavoviridis* group, whether regarded as consisting of species or races, will only be adequately elucidated by careful field work and dissections.

Nomia frenchi Cockerell.

Male from Woodend, Victoria (French). Black, length about 7.5 mm.; separated from *N. generosa* Smith, by the enlarged hind femora and tibiae, and the dark hair on the thorax above; and from *N. argentifrons* Smith by the black flagellum, and red tibiae and tarsi. It is also allied to *N. moerens ulongensis* Ckll., which is 10.5 mm. long.

Nomia generosa Smith.

The type is a male from Moreton Bay, Queensland. It is black, closely and finely punctured, the tibiae and tarsi bright ferruginous; antennae as long as head and thorax; tergites after the first with narrow white hair-bands. The hind femora and tibiae are not enlarged. It is recorded from Mackay in Amer. Mus. Novitates, 343, 1929, p. 11.

Nomia geophila Cockerell.

Male 8 to 9 mm.; black, with hind margins of second and following tergites hyaline. It is closely related to *N. gilberti* Ckll., but has antennae a little shorter, mesothorax shining, and postscutellum without the dense covering of pure white hair, nor are there conspicuous white hair-patches at sides of scutellum. In *N. frenchi* the antennae are very much longer. Type in Queensland Museum (Mem. Queensland Museum, x., 1930, p. 49.)

Nomia gilberti Cockerell.

Mackay (Turner). The female is very like *N. tenuihirta* Ckll., from the same locality, but is known by the honey-coloured stigma; more hyaline wings, with the apex obviously darkened; piceous tegulae, with a whitish spot on outer margin; and the structure of the metathorax.

Nomia gracilipes Smith.

Smith described both sexes from Adelaide. Head and thorax black, the abdomen blue, with the apex ferruginous. The flagellum is bright fulvous beneath in the male. This is a conspicuously smaller species than *N. australica* Smith. In a female from Darra, Brisbane, the last three tergites were chestnut red, much brighter than usual.

Nomia grisella Cockerell.

Female about 9 mm. long, from Cape York, Queensland. It has more recently been taken at Gordonvale. It is very close to *N. muscosa* Ckll.,

but third joint of labial palpi longer; mesothorax not so hairy, the dull, very finely punctured surface visible; hind margins of second and following tergites light testaceous. The tongue is long and filiform.

Nomia halictella Cockerell.

Found by Turner at Mackay, and now known as far south as Brisbane. Type in British Museum. The female is about 8.5 mm. long, with the aspect of an *Halictus*; the tergites have the hind margins rufescent, those of third and fourth with broad, dense, entire fulvo-ochraceous hair-bands; on the first and second tergites these bands only appear laterally, or the band on second may be nearly complete. The wings are strongly dusky. The form described as variety *triangularis* is a distinct species. The male *N. halictella* has a subclavate abdomen.

Nomia hippophila Cockerell.

The type, in Berlin Museum, was collected by Coulon at Port Phillip, Victoria. The species goes north to New South Wales. The characters of this, and its race *purnongensis* Ckll., from Purnong, S.A., are sufficiently indicated in the key.

Nomia hypodonta Cockerell.

Mackay, Queensland; type in British Museum. Allied to *N. dentiventris* Smith, but the male (about 8 mm. long) has the pubescence of a different colour (of head and thorax white, a little yellowish on face, vertex, mesothorax and scutellum), the hind femora do not present a large swelling beneath, and the ferruginous colour on the legs is lacking. The abdomen is blue-black, with the hind margins of the tergites pure black; the third sternite has a pair of prominences, each terminating in a short sharp spine. A variety has the flagellum dull reddish beneath.

Nomia kurandina Cockerell.

Kuranda, Queensland (Turner). Related to *N. gilberti*, but easily separated by the apical spots on anterior wings. The male is about 9 mm. long. The female has the dark wing spots more dilute; the clypeus and supraclypeal area show a strong median ridge. The type is in British Museum. *N. macularis* Friese, described from Mackay, appears to be the same species.

N. kurandina fortior Ckll. (Rec. Australian Museum, xvii., p. 226) is a larger race from Gundamaian, Port Hacking, N.S.W., where it was found by T. G. Campbell. It has the dark apical wing-spots large and very conspicuous. Antennae and tegulae entirely black.

Nomia latetibialis Friese.

Male from Adelaide. A very distinct species, rather suggestive of *N. gracilipes* Smith. Head and thorax black, but abdomen dark red suffused with purple, the third and fourth tergites dark dull purple, except the red hind margins, while the last two tergites are pale testaceous. There are no hair-bands. The venter is flat and simple, except that the fourth sternite is emarginate in the middle, and from beneath the emargination projects a stout curved red spine. Flagellum very long.

Nomia latiuscula Friese.

Female collected by Turner at Mackay. Length 8 to 9 mm., said to be nearest to *N. cincta* Sm., but clypeus short, normal; pubescence fulvous;

wings with darkened margin; legs rufous or fulvous. So far as I can make out, this is a synonym of *N. semiaurea* Ckll.

Nomia lepidota Cockerell.

Female from Sydney; type in British Museum. It is about 7 mm. long, black, with the hind margins of tergites narrowly reddish. It is known by the very large tegulae (about three-quarters length of mesothorax), and bandless abdomen. The flagellum is obscure ferruginous beneath; legs very dark reddish.

Nomia lyonsiae Cockerell.

Female collected by Hacker at Brisbane and Stradbroke Island, Queensland. This is a species allied to the Indian *N. ellioti* Smith, having a bidentate structure on postscutellum, which is like a fish tail in the female, but has sharper points in the male. The male has a pair of small projections on the strongly bilobed scutellum. The abdomen has broad green tegumentary bands, suffused with vermillion. When the female was described, it was suggested that it might belong with *N. darwinorum* Ckll., then only known from the male. Now having both sexes of each, I fall to find any very salient differences, though the scutellum (female) of *N. lyonsiae* is larger and more flattened. I can only conclude that *N. lyonsiae* is at best a weak race of *N. darwinorum*, which is itself hardly more than a race of *N. rubroviridis*.

Nomia melanodonta Cockerell.

Male, about 9 mm. long, from Wodonga, Victoria; type in Melbourne Museum. It looks like *N. frenchi*, but has the flagellum bright ferruginous beneath, dark red above; hind tibiae subtrigonal, with a prominent apical anterior broadly truncate lobe; fourth sternite deeply emarginate, and from the emargination proceeds a polished sharp black tooth. There is no such tooth in *N. frenchi*.

Nomia melanopectera Cockerell.

Found by Turner at Kuranda, Queensland; type in British Museum. The female is nearly 10 mm. long, similar to *N. stalkerii*, *N. gilberti*, etc., but distinguished by the very dark wings, dark spurs, and feebly sculptured abdomen. It is rather robust, with white and black hair; eyes strongly converging below; a more or less evident raised line down middle of clypeus; tongue long and linear.

Nomia melvilliana Cockerell.

Male, a little over 7 mm. long, from Melville Island (G. F. Hill); type in American Museum of Natural History. It is very close to *N. kurandina*, but less robust, with shorter flagellum. The tegulae are pale testaceous. (Amer. Mus. Novitates, 346, 1929, p. 4.)

Nomia moerens Smith.

Appears to be a common species, from Victoria to National Park, Queensland. The characters are indicated in the table. *N. moerens ulongensis* Ckll. (Rec. Austral Mus., xvii., p. 227), from Ulong, East Dorrig, N.S.W., is based on males, 10.5 mm. long, with deep chestnut red tegulae. The mandibles, clypeus and antennae are entirely black; hind femora swollen, shining, not appreciably curved; hind tibiae stout, trigonal, the

anterior edge bulging, but no apical lobe. Smith suggested that *N. generosa* was probably the male of *N. moerens*.

Nomia muscosa Cockerell.

The type, from Mackay, is in the British Museum; the species goes south to New South Wales. The female, about 10 mm. long, is superficially like *N. melanoptera*, but has the mesothorax covered with a greyish moss-like tomentum, which appears black-speckled from the origin of many bristle-like black hairs; area of metathorax quite different, the apical triangle dull, and not cut off from the very narrow finely cross-ridged basal band; wings not nearly so dark. The male is similar, with the hind legs very little modified.

Nomia nana Smith.

New South Wales and South Australia. A specimen in the British Museum is labelled North-west Australia, but this habitat seems to need confirmation. Smith described the male as *N. ruficornis*, and this name being preoccupied, *N. smithella* was substituted by Gribodo in 1894. The characters of *N. nana* are indicated in the table.

Nomia pennata Friese.

Male, 6-6.5 mm. long, from Adelaide. It is said to be like *N. turneri* Friese, but with long antennae, fulvous tarsi, and a small brown spot at end of anterior wings. Legs black; tibiae and tarsi more or less fulvous, hind tibiae with a dark spot; tegulae brown; wings hyaline.

Nomia pseudoceratina Cockerell.

The type, from Mackay, is in the British Museum. From recent studies (Psyche, June, 1930, p. 146) I have concluded that this is the male of *N. halictella* var. *triangularis*. It is a distinct species, to be called *N. triangularis* Ckll.

Nomia pulchribalteata austrovagans Cockerell.

The type, from F. Smith's collection, is in the British Museum, and is labelled as coming from Adelaide. The male, with two long black spines on postscutellum, is very close to *N. westwoodii* Gribodo, from Bengal, and *N. pulchribalteata* Cameron, from New Britain, but is known by the purple tints of the abdominal bands, resembling in this respect *N. formosa* Sm., from Celebes. A full description appears in Entomologist, September, 1905, p. 218. I cannot help suspecting that the locality is erroneous.

Nomia rubroviridis Cockerell.

North-west coast of Australia. Female about 10.5 mm. long; postscutellum with a bifid fish-tail like process; tegulae large, the inner hind corner pointed, the base fuscous, the middle ferruginous, the outer hind part broadly creamy-white; antennae dark; hind margins of first four tergites with very broad entire emerald-green bands, the first two suffused on their anterior half with vermillion; fifth tergite with a dense fringe of ochreous hair, and apical segment covered with the same. Type in British Museum. Although marked North-west Australia, it bears also the accession number 69.50, which is said to mean "purchased from Mr. Du Boulay, collected in W. Australia, Nicol Bay, Swan River and Champion Bay."

Nomia rufocognita Cockerell.

Type, in British Museum, from Mackay. It is a male, and was said to

be closely allied to *N. generosa* Sm., but distinguished by the fulvous pubescence. The tegulae are ordinary, bright ferruginous, the margins subhyaline; tibiae and tarsi bright ferruginous, the tibiae with a blackish spot in front. Length about 9 mm. In Entomologist, April, 1913. I considered that this must be the male of *N. semiaurea* Ckll., from the same locality. However, in Ann. Mag. Nat. Hist., July, 1829, p. 137, I described what I regarded as the true male of *N. semiaurea* from Thursday Island. It has a remarkable long black flagellum, the joints curved and producing a twisted effect. All the tarsi are bright chestnut red, the anterior and hind tibiae red at apex. This Thursday Island bee was later separated (1930) as *N. semiaurea thor* Ckll. It is perhaps a fact that *N. rufocognita* is after all *N. semiaurea*, and the Thursday Island insect a distinct species, *N. thor*?

Nomia satelles Cockerell.

The type was taken by French at Rutherglen, Victoria. It also occurs in New South Wales. It has a general resemblance to *N. australica* Smith, but is easily separated by the smaller size (male about 8.5 mm., female 9.5 to 10 mm.), and black colour. The first tergite of the female is closely and finely punctured on the disc as in *N. australica*.

Nomia semiaurea Cockerell.

Type female from Mackay, in British Museum. For the characters see the table, and the above discussion under *N. rufocognita*. It is to be noted that *N. semiaurea* and *N. rufocognita* were both published September, 1905; being thus of even date, I choose *N. semiaurea* as the name of the species, if they are united.

Nomia semipallida Cockerell.

Type female, about 8 mm. long, from Mackay, in British Museum. Known by the broadly whitish margins of the tergites. Antennae wholly dark; mandibles light ferruginous with the apex black; tongue long and slender; wings dull hyaline; tegulae pale rufous, with a dark basal spot. The second cubital cell is extremely small.

Nomia stalkerii Cockerell.

Type in British Museum, collected by W. Stalker at Alexandria. It is a male, about 10 mm. long; black, the head and thorax with abundant pale hair, white below, faintly yellowish dorsally; antennae short for a male, flagellum less than 3 mm., ferruginous beneath; wings strongly dusky; hind legs not modified. Very close to *N. tenuihirta* and *N. gilberti*, but known by the darker wings and red spurs.

Nomia subaustralica Cockerell.

Based on the female, in Berlin Museum, from Tennant's Creek, South Australia. Also from Finke River, Hermannsburg. It is about 11 mm. long, the abdomen somewhat metallic, with broad pale ochreous hair-bands. It resembles *N. australica*, but differs in many points, having scape red in front; base of flagellum (about two joints) lively red above and below, rest of flagellum black, except a reddish stain at apex; tegulae pale testaceous, the margins whitish; mesothorax densely covered in front, behind, and more or less at sides with easily deciduous moss-like light fulvous hair, and with no erect black hair; stigma shorter; abdomen black. the first two tergites strongly tinted with green (or purplish on second).

Nomia submoerens Cockerell.

Discovered by Littler at Bridport, Tasmania. It appears to be common on that island. The female is like *N. moerens*, but the transverse cross-striated channel at base of metathorax is much narrower in middle; wings shorter, nervures darker; tegulae anteriorly with a pale marginal spot.

Nomia tenuihirta Cockerell.

Collected by Turner at Mackay; type in British Museum. The male is about 8 mm. long; black, even to the tarsi, the flagellum obscure brownish beneath; abdomen without distinct hair-bands. The female is very like that of *N. gilberti*, but has the basal enclosure of metathorax almost linear at sides, dull, granular, without distinct cross-ridges; tegulae pale testaceous, fuscous basally, and with a whitish patch posteriorly; stigma dark reddish-piceous; wings more dusky, the apex uniform with the rest. *N. latitarsis* Friese is a synonym.

Nomia testaceipes (Friese).

Male found by the celebrated botanist von Mueller in Central Australia. It is one of the *N. flavoviridis* group, distinguished by the black head, mesothorax and scutellum (though dark green pleura); lower half of clypeus white; flagellum bright ferruginous beneath, but dusky above; tegulae clear bright apricot colour; legs red, with the femora more or less dark; abdomen dark olive green, but lighter and brighter on first tergite; third and fourth sternites each with a pair of light ferruginous protuberances.

Nomia tomentifera (Friese).

A Queensland species, from Kuranda, Babinda, Cooktown and Dunk Island. It is a distinct form, readily determined from the table. Friese sent out both this and *N. semiaurea* as *N. cincta* var. *tomentifera*; the differences are set forth in Amer. Mus. Novitates, 343, 1929, p. 10.

Nomia triangularis (Cockerell).

Type from Mackay, in British Museum. See above under *N. pseudoceratina* and *N. halictella*. The differential characters are given in the table.

Nomia turneri Friese.

Male, 7 mm. long, taken by Turner at Mackay, at flowers of *Eucalyptus* in March. It is said to resemble *N. nana* Sm. (but what Friese had as *N. nana* was *N. halictella* Ckll.), but with unusually short and thick antennae, and tergites 2 and 3 with reddish margin. All the tarsi are yellowish; wings almost clear; tegulae brown.

Nomia victoriae Cockerell.

Type, in the Berlin Museum, from Ararat, Victoria. *N. fulvoanalis* Friese, from the same locality, is a synonym. For the characters see the table, and note under the closely related *N. analis* Friese. See also Amer. Mus. Novitates, 343, 1929, p. 9.

Nomia williamsi Cockerell.

Male taken by F. X. Williams at Halifax, Queensland, in 1919; type in Museum of Comparative Zoology, Harvard University. It is about 7.3 mm. long, very close to *N. halictella*, but smaller, with white instead of fulvous hair, and darker flagellum. The stigma is large, light orange-fulvous, the

nervures pale testaceous; hind legs not modified; venter of abdomen simple, except for a large patch of pale fulvous-tinted tomentum. The scape is entirely black, whereas in *N. argentifrons* Sm. it is rufotestaceous in front.

I have not tried to sort the above *Nomia* into subgenera, but the subgenus *Hoplonomia*, Ashmead, 1904, includes those with a bidentate process or pair of spines on postscutellum, and metallic tegumentary bands on abdomen. It is found widely distributed in the Oriental Region. The Australian species are very closely allied to the Asiatic ones.

Friese, in 1924, published a "*Nomia* (?) *flavopunctata*," female 7 mm. long, found by Turner at Mackay, visiting *Xanthorrhoea* in April. It is said to be known by the anterior corners of thorax and the tubercles thickly covered with yellow tomentum. This seems to me to be a *Paracolletes* of the type of *P. irroratus* Smith, for the characters of which see Ann. Mag. Nat. Hist., June, 1926, p. 661.

REEPENIA Friese.

Published in 1909 as a subgenus of *Nomia*, the type being *N. variabilis* Friese. It was separated on the abdominal characters, but the stigma on the hind wings (at least in the Australian species) is more remarkable.

Reepenia eboracina (Cockerell).

The male was found by Froggatt at Cape York, Queensland. It also occurs at Gordonvale. I have placed the species in the table of *Nomia*, where sufficient characters for recognition are given.

The genus *Nomioides* is related to *Halictus*, not to *Nomia*.

NOTE.—In the account of *Megachile* (Q.) signifies that the species is represented in the Queensland Museum.
